



National Transportation Safety Board Aviation Accident Final Report

Location:	Salt Lake City, UT	Accident Number:	DEN03TA079
Date & Time:	05/10/2003, 1209 MDT	Registration:	N263WL
Aircraft:	McDonnell Douglas A-4N	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	1 Fatal
Flight Conducted Under:	Public Aircraft		

Analysis

The airplane was a former military (non-certificated) aircraft which was under contract to the U.S. Army. It was descending over the Great Salt Lake for landing at Hill Air Force Base when the engine ingested a bird. Subsequently the engine was heavily FOD damaged, and the turbine section was melted. The pilot ejected from the airplane, but the ejection seat system malfunctioned and the pilot was fatally injured. The airplane impacted the lake. The airplane had been contracted and built for the Israeli Defense Force in 1974. The maintenance log books and physical evidence indicated that they had made modifications to the ejection seat assembly. Naval Air Station (NAVAIR DEPOT), Jacksonville, Florida, personnel evaluated the ejection seat system and determined that the left hand coupling assembly (which has very critical parameters for proper operation) had not separated as designed. The NAVAIR DEPOT personnel could not determine the reason the left hand coupling assembly did not operate properly, as the airplane's cockpit was not recovered from the Great Salt Lake.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The loss of engine power during descent due to the in-flight collision with a bird which FOD damaged the engine and subsequently melted the turbine section. A contributing factor was the airplane's malfunctioning ejection seat.

Findings

Occurrence #1: IN FLIGHT COLLISION WITH OBJECT

Phase of Operation: DESCENT

Findings

1. (C) OBJECT - BIRD(S)

Occurrence #2: LOSS OF ENGINE POWER

Phase of Operation: DESCENT

Findings

2. (C) POWERPLANT - FOREIGN OBJECT DAMAGE

3. (C) POWERPLANT - MELTED

Occurrence #3: MISCELLANEOUS/OTHER

Phase of Operation: DESCENT - EMERGENCY

Findings

4. BAIL-OUT/EMERGENCY EJECTION - PERFORMED - PILOT IN COMMAND

5. (F) FUSELAGE,SEAT - MALFUNCTION

Occurrence #4: IN FLIGHT COLLISION WITH TERRAIN/WATER

Phase of Operation: DESCENT - UNCONTROLLED

Findings

6. TERRAIN CONDITION - WATER

Factual Information

HISTORY OF FLIGHT

On May 10, 2003, at approximately 1209 mountain daylight time, a former military non-certificated McDonnell Douglas A-4N Skyhawk, N263WL, was destroyed when it impacted the Great Salt Lake following a loss of engine power near Salt Lake City, Utah. The airline transport pilot, the sole occupant on the airplane, was fatally injured. Advanced Training Systems International (ATSI), Inc., Mesa, Arizona, was operating the airplane, under contract to the United States Government (U.S. Army Big Crow Program Office), as a public use flight. Visual meteorological conditions prevailed for the cross-country flight that originated from Mesa, Arizona, at approximately 1100. The pilot was flying the number two aircraft, in a flight of three, under an instrument flight rules (IFR) flight plan. The planned destination was Hill Air Force Base, Ogden, Utah.

According to ATSI, the airplane was number two in a flight of three fighters that were repositioning from Williams Gateway Airport, Mesa, Arizona, to Cold Lake Military Airport, Cold Lake, Alberta, Canada, to support the Canadian military forces in training. The lead pilot reported that the flight was uneventful until the descent into Hill Air Force Base. He said that the flight had leveled off at 12,000 feet on a heading of 340 degrees with an indicated airspeed of 300 knots. Then, number three observed a "fairly thick vapor trail (white) emanate from the center fuselage of the aircraft [number two] and then stop. Duration of the event was less than 2 seconds. I was about to query the pilot about it when he reported, 'I'm having engine problems'."

The lead pilot instructed the pilot to proceed directly to Hill Air Force Base on an approximate heading of 060 degrees. The lead pilot further suggested that the pilot drop his external fuel tanks and try to stay in visual flight conditions. After approximately one minute, the accident airplane had slowed to approximately 200 knots and its rate of descent was increasing. The lead pilot said, "are you in manual fuel control?" The pilot said, "not yet, I've got 200 knots." In his next transmission he said, "I've got 30% [power]". Lead asked "rat [an emergency electrical generating device] out?" The pilot responded "yes, I'm starting to lose flight controls." Lead said, "you have the manual flight control handle." The pilot said, "I hmm have to get out."

Approximately 2 to 3 seconds later, the nose of the airplane came up [to reduce the descent rate and airspeed], and the pilot ejected from the airplane at approximately 1,000 to 1,500 feet above the lake. Both witness pilots reported that the ejection seat appeared to veer immediately left after the seat cleared the cockpit. The lead pilot said that the pilot/seat separation sequence appeared to be "fairly violent (unstable) and [the] pilot and [the] seat stayed very close together throughout the rest of the free-fall." He said that the airplane remained wings level, slowly nosed over, and impacted the water. He said that 3 to 4 seconds later, the pilot and ejection seat simultaneously impacted the water "very close together." No parachute was observed.

A Lifeguard helicopter came to the scene, and with the aid of two Antelope Island State Park rangers, in a boat, retrieved the pilot's body from the lake.

PERSONAL INFORMATION

ATSI reported that the pilot had approximately 10,500 hours of flight experience, and a current

first class medical dated January 2, 2003. The pilot had flown A-4 Skyhawks for the Navy; at the time of the accident, he was employed as a pilot for Delta Airlines. The pilot had a letter of authorization (LOA), dated November 27, 2002, to act as pilot in command of all Douglas A-4 Skyhawk models. At the time of the accident, he was current in all ATSI required training.

AIRCRAFT INFORMATION

The airplane (Bureau Number 159523) was a single engine, single seat, delta-platform wing, retired military fighter manufactured by the McDonnell Douglas Aircraft Company, for the Israeli Defense Force (IDF). It had an unofficial manufacturing date of October 18, 1974. The airplane had a gross weight limitation of 24,500 pounds, and was powered by a Pratt and Whitney J52 P-408 gas turbine engine with 11,200 pounds of thrust. The U.S. Navy originally specified that the A-4 Skyhawk's airframe have a 7,500-hour life; they later changed that to a 12,000-hour life. ATSI reported that the accident airplane, which they purchased from the IDF in early 2001, had accumulated a total of 2,664 flight hours.

The airplane was equipped with a McDonnell Douglas, Escapac, 1G-3 ejection seat (S/N A18-257), which was the same model ejection seat that it left the factory with. This seat was capable of functioning properly with the airplane stationary on the ground, i.e., zero airspeed-zero altitude capability. A Navy ejection seat engineer stated that the 1G-3 Ejection Seat is ideal for low altitude low speed ejections (below 8,000 feet and airspeed less than 250 knots).

ATSI reported that all routine and preventive maintenance on the aircraft, including the ejection seat and parachute, were current at the time of the accident.

METEOROLOGICAL INFORMATION

At 1211, the weather conditions at Salt Lake City International Airport (elevation 4,227 feet), Salt Lake City, Utah, approximately 100 degrees, 18 nautical miles (nm) from the accident site, were as follows: wind 120 degrees at 7 knots; visibility 10 statute miles; cloud condition 1,200 feet few, 3,400 feet broken, 5,500 feet broken; temperature 44 degrees Fahrenheit; dew point 41 degrees Fahrenheit; altimeter setting 30.08 inches.

WRECKAGE AND IMPACT INFORMATION

The wreckage was located in the Great Salt Lake (N40 degrees, 53', 45"; W112 degrees, 16', 45"; elevation 4,206 feet), Salt Lake City, Utah. Retrieval of the wreckage took considerable effort due to poor underwater visibility, high saline densities (approximately 17 times more saline than the Pacific Ocean), and unknown depths of silt deposits; the water depth was approximately 22 feet. Pieces of the empennage and the engine were lifted from the lake on June 3, 2003; the ejection seat was retrieved on June 7, 2003.

MEDICAL AND PATHOLOGICAL INFORMATION

The State of Utah's Department of Health, Office of the Medical Examiner, Salt Lake City, Utah, performed an autopsy on the pilot on May 10, 2003. The medical examiner determined that the pilot died from blunt force to the neck.

The FAA's Civil Aeromedical Institute (CAMI) in Oklahoma City, Oklahoma, performed toxicology tests on the pilot. According to CAMI's report (#200300132001), carbon monoxide and cyanide tests were not performed. The vitreous was tested for ethanol with negative results; the urine was tested for drugs with negative results.

TESTS AND RESEARCH

The airplane's Pratt and Whitney J52 P-408 engine (Serial Number 686484) with its fuel control unit were sent to the Naval Air Station (NAVAIR DEPOT), Jacksonville, Florida, for teardown and evaluation. Their investigation revealed that the engine was FOD [Foreign Object Damage] damaged, and evidence of feather and organic material was found in/on the turbine nozzle support, turbine case, turbine vanes and blades, and exhaust case. Feather material was also found inside solidified, pooled metal. The turbine section exhibited substantial turbine blade melting throughout, with evidence of metal spattering, dripping, and pooling.

Several fuel lines from the accident airplane and two sister aircraft were sent to Wright-Patterson Air Force Base's, Materials Integrity Branch for evaluation. After visual, nondestructive, and fractographic examination, seven of the hoses (including all the accident aircraft samples) revealed various characteristics that did not meet Mil-DTL-8794 and Mil-DTL-8795 specifications. Additionally, a laboratory technician who assisted in the work said "even though the hoses from the accident aircraft did not meet all design specifications and they exhibited some physical damage, no evidence could be found to indicate that the hoses were compromised before the airplane's impact into the lake."

The number three airplane in the formation had observed a "fairly thick vapor trail (white)" emanate from the accident aircraft just before the pilot reported having engine problems. A representative of the engine manufacturer said that a pressure/fuel dump valve was located between the fuel controller and the fuel injection nozzles. Its external opening was on the bottom (right of center) of the fuselage. This valve would open if the fuel pressure dropped below 4 to 6 psi (pounds per square inch). He said that an engine stall or airflow disruption could cause the fuel pressure to drop and the dump valve to open, i.e., fuel would stream from the airplane.

The airplane's maintenance records and physical evidence on the 1G-3 ejection seat indicated that the IDF had made some changes and modifications to the ejection seat system. Additionally, the IDF had removed and reinstalled the ejection seat in 1994 for required maintenance.

The airplane's ejection seat (McDonnell Douglas Escapac 1G-3; S/N A18-257) was sent to the Naval Air Station (NAVAIR DEPOT), Jacksonville, Florida, for teardown and evaluation. Visual examination, by their personnel, confirmed that all recovered ejection seat (egress system) cartridges and propellant actuated devices functioned as designed, and ballistic gases were not impeded in performing their functions. No pertinent abnormalities were noted. Physical evidence indicated that the pilot initiated the ejection.

The NAVAIR DEPOT personnel said that the ejection seat was mounted to the cockpit floor and aligned in place with two guide rails in the cockpit. A quick disconnect on the right hand side and a coupling assembly on the left hand side permitted emergency separation of the ejection seat from the cockpit during the ejection sequence. The right hand (RH) quick disconnect, part number 4352D23LD4, functioned as designed. The left hand (LH) coupling assembly, part number D33LA, did not disconnect. Examination of the LH coupling assembly revealed no discrepancies that would have prevented it from functioning.

The NAVAIR DEPOT personnel said that for the LH coupling assembly to function properly, its connecting hose (part number 7579263-579; which transmits the breakaway force to the coupling assembly during ejection) must be connected properly to its "Tee" fitting (AN804-4).

This in turn must be properly secured to its bracket (part number 4578074-1), and subsequently the bracket must be properly installed according to specifications on the aircraft LH guide rail. The NAVAIR DEPOT personnel said that any variations in the location of the "Tee" fitting and/or its bracket could lead to a disconnect malfunction of the LH coupling assembly. Since the airplane's cockpit was never recovered, investigators were unable to confirm the bracket's condition and location, and if the "Tee" fitting had been properly secured to the bracket.

NAVAIR DEPOT personnel determined that during the ejection sequence, if the LH coupling assembly did not disconnect, the ballistic hose (part number 5824390-5), which extended from the "Tee" fitting to the MK-16 rocket located under the pilot's seat, would have come under tension after approximately 67 inches of upward seat travel. Since the length of the two ejection seat guide rails in the A-4 Skyhawk was 49 inches, the seat would have cleared the rails and cockpit prior to the MK-16 rocket hose assembly reaching its full extension. NAVAIR DEPOT personnel determined that a force of approximately 2,880 pounds would have been required to separate the rocket hose assembly and securing clamps from the left lower side [bottom] of the ejection seat after the hose had reached full extension. They also determined that if this force was applied to the left lower side [bottom] of the ejection seat for at least 0.25 seconds, the seat/occupant would veer left as reported by witnesses and eventually strike the airplane's left horizontal stabilizer.

Two personnel from the accident investigation team traveled to Hill Air Force Base (where the wreckage was stored), Ogden, Utah, on August 28 and 29, 2003, to see if the ejection seat could be matched to the accident airplane's damaged empennage. The ejection seat exhibited "extensive" denting and tearing signatures of the metal on the left side of the seat. The team members placed the seat in the damaged empennage to see if there was consistency with the damaged left horizontal stabilizer, vertical stabilizer, and rudder. According to team members, the juxtaposition of the ejection seat to the empennage damage appears to be a "nearly perfect fit."

The lead pilot said that the man-seat separation occurred just above and aft (of the cockpit), on the left side of the aircraft. He said that the "separation appeared to be fairly violent (unstable), and [the] pilot and [the] seat stayed very close together throughout the rest of the free-fall. No [parachute] chute was observed." The NAVAIR DEPOT ejection seat specialist said that:

"Under normal conditions, seat/man separation (activation of the automatic release and seat/man separation rocket) should have occurred prior to the ejection seat impacting the left hand tail section of the mishap aircraft. No discrepancies were noted in any of the automatic restrain release system components that would have caused a delay in the seat/man separation process. However, the seat's instability could have prevented a clean seat/man separation. The change in trajectory and impact with the tail section of the mishap aircraft may have prevented a proper seat/man separation. This would have an effect on the NES-12 parachute deployment due to the fact that the parachute lanyard has to stretch to activate the parachute actuator cartridge (MK-4)."

ADDITIONAL INFORMATION

The airplane, including all components and logbooks, were never taken into NTSB custody.

This airplane was being operated as part of a civilian contractual program to the U.S. Army, Big

Crow Program Office. An independent accident investigation board was assembled, and they investigated the accident under the auspices of the National Transportation Safety Board. Many individuals and agencies, including the U.S. Navy, U.S. Air Force, U.S. Army, Department of Interior, and Advanced Training Systems International, Inc. contributed to this investigation.

Pilot Information

Certificate:	Airline Transport; Flight Engineer	Age:	42, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Single
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	Last FAA Medical Exam:	01/02/2003
Occupational Pilot:		Last Flight Review or Equivalent:	11/20/2002
Flight Time:	10500 hours (Total, all aircraft), 199 hours (Total, this make and model), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	McDonnell Douglas	Registration:	N263WL
Model/Series:	A-4N	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Experimental	Serial Number:	159523
Landing Gear Type:	Retractable - Tricycle	Seats:	1
Date/Type of Last Inspection:	05/04/2003, AAIP	Certified Max Gross Wt.:	24500 lbs
Time Since Last Inspection:	2 Hours	Engines:	1 Turbo Jet
Airframe Total Time:	2664 Hours at time of accident	Engine Manufacturer:	Pratt & Whitney
ELT:	Not installed	Engine Model/Series:	J52 P-408
Registered Owner:	Advanced Training Systems International Inc.	Rated Power:	11200 lbs
Operator:	Advanced Training Systems International Inc.	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	SLC, 4227 ft msl	Distance from Accident Site:	18 Nautical Miles
Observation Time:	1211 MDT	Direction from Accident Site:	100°
Lowest Cloud Condition:	Few / 1200 ft agl	Visibility	10 Miles
Lowest Ceiling:	Broken / 3400 ft agl	Visibility (RVR):	
Wind Speed/Gusts:	7 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	120°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.08 inches Hg	Temperature/Dew Point:	7° C / 5° C
Precipitation and Obscuration:			
Departure Point:	Mesa, AZ (IWA)	Type of Flight Plan Filed:	IFR
Destination:	Ogden, UT (HIF)	Type of Clearance:	IFR; VFR
Departure Time:	1100 MDT	Type of Airspace:	Class B

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	40.893056, -112.276111

Administrative Information

Investigator In Charge (IIC):	James F Struhsaker	Report Date:	06/08/2005
Additional Participating Persons:	Floyd J Landon; FAA FSDO; Salt Lake City, UT		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinquiry@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).